



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/618,492 | 07/11/2003 | Noh Yeal Kwak | 29936/39475 | 5408 |

4743 7590 04/20/2004

MARSHALL, GERSTEIN & BORUN LLP
6300 SEARS TOWER
233 S. WACKER DRIVE
CHICAGO, IL 60606

EXAMINER

SARKAR, ASOK K

ART UNIT PAPER NUMBER

2829

DATE MAILED: 04/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/618,492

Applicant(s)

KWAK, NOH YEAL

Examiner

Asok K. Sarkar

Art Unit

2829

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☒ Claim(s) 1,3 and 7 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: In page 3, line 23, the word "species" should be inserted after monoatomic.

Appropriate correction is required.

2. 35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms, which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: in page 4, line 15, the meaning of the phrase "implanting a 3 balance dopant" was not clear and should be replaced with generally accepted terms such as (Group III elements).

3. Claim 1 is objected to because of the following informalities: in line 7, "3 balance dopant" should be replaced with clear terminology. In line 8, the word 'species' should be inserted after the word monotonic. Appropriate correction is required.

4. Claim 3 is objected to because of the following informalities: in line 7, "3 balance dopant" should be replaced with clear terminology. In line 16, the word 'of' after dopant should be replaced with "at". The values and the units for the ion energy should be written clearly. Appropriate correction is required.

5. Claim 7 is objected to because of the following informalities: in line 6, "at the ratio..." should be replaced with "at the rate...". Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1 – 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Ramkumar, US 6,555,484.

Regarding claim 1, Ramkumar teaches a method of manufacturing a semiconductor device comprising the steps of:

- providing a semiconductor substrate 10 for which given processes for forming the semiconductor device are implemented with reference to Fig. 1(b), and
- implanting dopant having a higher atomic weight than boron and made of monoatomic at a given depth of the semiconductor substrate by means of an ion implantation process, thus forming an ion implantation layer with respect to Fig. 1 (c) in between column 1, line 26 to column 3, line 15.

Regarding claim 2, Ramkumar teaches forming a screen oxide film (sacrificial layer) 18 on the 10 with respect to Fig. 1(b).

Regarding claim 3, Ramkumar teaches doping dosage of $5 \times 10^{11} - 10^{13}$ ion/cm² and energy of 10 – 50 KeV in column 3, lines 8 – 15.

Regarding claim 4, Ramkumar teaches indium in column 3, line 13.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ramkumar, US 6,555,484 in view of Chen, US 5,605,849.

Ramkumar fails to teach implantation at tilt angle of 3 – 13°.

Chen teaches that implantation at tilt angle of 3 – 13° relative to the vertical reduces undesirable channeling along crystal structure for the benefit of obtaining accurate dopant profiling in column 1, lines 45 – 56.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Ramkumar and perform implantation at tilt angle of 3 – 13° to reduce undesirable channeling along crystal structure and for the benefit of obtaining accurate dopant profiling as taught by Chen in column 1, lines 45 – 56 so that the oxidation layer thickness can be accurately controlled.

Art Unit: 2829

11. Claims 6 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramkumar, US 6,555,484 in view of Tsai, US 6,245,639.

Regarding these claims Ramkumar teaches the step of annealing to activate the dopant at a temperature of 800 – 1100° C for sufficient time in column 3, lines 15 – 20, but fails to teach rapid thermal annealing process at a rate of 20 – 50°C/sec for 5 – 30 seconds in nitrogen atmosphere.

Tsai teaches rapid thermal annealing process in nitrogen atmosphere for 5 – 15 seconds for the benefit of in order to limit the degree of dopant diffusion within the substrate in column 5, lines 26 – 32.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Ramkumar and perform rapid thermal annealing process in nitrogen atmosphere for 5 – 15 seconds for the benefit of limiting the degree of dopant diffusion within the substrate as taught by Tsai in column 5, lines 26 – 32 so that a uniform oxidation layer is achieved.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 571 272 1957. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2829

13. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Asok Kumar Sarkar

Asok K. Sarkar
April 14, 2004

Patent Examiner